

# Microbial degradation of chemicals and fluids in aquifers

This project will establish baselines for microbial communities in the Tertiary Limestone Aquifer in South Australia. In addition, it will study the potential for microbial degradation of chemicals used by the onshore gas industry.



Groundwater aquifers are an important water source for communities, agriculture and industry, and the environment.

## KEY POINTS

- It is important to gather baseline data on the existing environmental health of the Tertiary Limestone Aquifer before any further onshore gas development.
- The study will use microorganisms in groundwater as a way of measuring environmental health.
- Researchers will test the effect on these microbes of a range of chemicals used in onshore gas production.
- The study will also explore the potential ability of microbes in this aquifer to detoxify and breakdown these chemicals.

## Tertiary Limestone Aquifer

The Tertiary Limestone Aquifer (TLA) is the primary groundwater supply for the Limestone Coast region, which covers an area of 13,300 km<sup>2</sup> in the south east of South Australia. The aquifer is used for many purposes, including town water supplies and a range of agricultural activities and industrial uses. The aquifer's environment is complex. Rainfall actively infiltrates some parts; in others the water in the aquifer is ancient, around 20,000 years old, and is replenished horizontally.

This project continues a series of CSIRO studies using microorganisms as an indicator of environmental health and investigating the potential for microbial degradation of chemicals and fluids used in onshore gas activities. The study will assess how microbes in the TLA may degrade a range of chemicals likely to be used in gas development.



Decommissioned gas well in the Penola region.

## The TLA and potential gas activity

There is public concern about the expansion of the onshore gas industry in South Australia's Limestone Coast region and the potential for any impacts on the environment and to human health. Access to water is critical to people living in towns, many regional industries and to the environment. It is therefore essential to ensure that gas development in the region is undertaken with limited impacts to groundwaters within the TLA.

## Modern methods to profile ancient organisms

Little is known about the microbiology of the waters of the TLA. This study will use DNA sequencing techniques to profile the entire range of microbial communities that live in these waters.

This will establish a microbial 'baseline' before any extensive onshore gas activities begin, allowing scientists to monitor any potential disturbance to the aquifer's environmental health by measuring changes against this baseline.

## Probing all parts of the aquifer

This project will collect 60 groundwater samples from 20 sites across the Limestone Coast region from relevant industries (viticulture, cattle and sheep farms, grain farms, fruit, vegetable and tree nut farms) ensuring that different parts of the aquifer itself are sampled. All data from the project will be used to create a 'microbial map' of the TLA. A microbial 'baseline' will provide a reference against which any changes to the environmental health of the aquifer's waters can be measured. This is important given the diverse environments within the aquifer.

## Bacteria can degrade gas industry chemicals

DNA profiling will also identify particular microbes in this aquifer that have the potential to detoxify and biodegrade chemicals used in gas exploration and development.

Microbes use compounds in various chemicals as sources of energy. Experiments in the GISERA project **Microbial degradation of onshore gas-related chemical compounds** showed that most gas-related chemicals were completely degraded in loam soils in the Penola region after 34 days.

This study will further explore the potential for microbes within aquifer water samples to degrade a similar range of chemicals. Twenty-six chemicals associated with onshore gas activities will be individually added to aquifer water samples and will be incubated for 120 days to determine whether different microbial communities can effectively degrade these chemicals.

## FREQUENTLY ASKED QUESTIONS

### What is the project timeline?

October 2020 – September 2021

### When will the results be available?

A final report, including recommendations for community, government and industry, is expected in September 2021. All results will be published on the GISERA website.

### Who is funding this project?

The project is co-funded by the Australian Government, the SA Government and CSIRO.

## ABOUT GISERA

The Gas Industry Social and Environmental Research Alliance (GISERA) is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research. Visit [gisera.csiro.au](http://gisera.csiro.au) for more information about GISERA's governance structure, projects and research findings.

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